



SDI FINAL EVALUATION FORM 1.1

PART 1:

Journal Name:	Physical Science International Journal
Manuscript Number:	2014_PSIJ_14201
Title of the Manuscript:	A natural solution to the dark energy problem
Type of the Article	

PART 2:

FINAL EVALUATOR'S comments on revised paper (if any)	Authors' response to final evaluator's comments
Even if the article raises an interesting thematic, and the authors have greatly improved the preliminary manuscript, <u>remains unanswered the main objection.</u> The Authors says: The conservation equation, covariant derivative of energy momentum tensor <u>would not be affected if the scale factor is complex.</u> In my paper, the calculations are based on these equations. The combination of acceleration equation and Friedmann equation implies that. Since only the real part of the scale factor is observable, the geodesic path would depend on the real part of the scale factor only. But The authors hypothesized that a complex scale factor does not affect the conservation equation, covariant derivative of energy momentum tensor is wrong. It`s easy see that the geodesic equation, and the geometry, is very different now. Because in the FRW metric, the matrix of metric tensor g_{uv}, is dependent of the scaling factor; and <u>there is not worth the argument that only the real part is the one that has some physical meaning.</u> As the <u>metric coefficients are depending on the square of the scale factor</u>, then also formally change the Cristoffer symbols, or affine connection, and therefore already the usual FRW model equations are not obtained. It is easy to verify that, consequently, not be regains Freedmann equation, as erroneously supposed authors. Please see P.J.L Peebles Principles of Physical Cosmology (Princeton Acad Press., pp 298 and ss; and Adler-R Bazin-M Shiffer-M Introduction to General Relativity (Mc Graw Hill Co) pp 338 and ss.	Thanks for the comments. I think some of my sentences have made confusion. I would like to clarify my idea here. Basically, the scale factor can be complex. This is the only way to make consistency for Friedmann equation if there exists some matter with imaginary energy density such as tachyonic particles. In principle, if the scale factor is complex, the line elements and geodesic equation would also be complex. However, since the spatial dimension is real in our observations, we cannot detect the imaginary part (but the imaginary part can affect the real part in Friedmann equation). Therefore, I assume that only real part of the scale factor is observable. For example, if we fix $dt=0$, $dy=0$ and $dz=0$, the line element $ds = a(t) dx$. The line element ds is a real observable, which corresponds to the length of a space. Therefore, only real part of the scale factor $a(t)$ is the observed scale factor. That means $ds = a_r dx$. As a result, what I suggest is that theoretically the line element is $ds^2=dt^2-a^2(dx^2+dy^2+dz^2)$, but the observed line element is $ds^2=dt^2-a_r^2(dx^2+dy^2+dz^2)$. Theoretically, all equations in General Relativity is complex, but the true observables are only dependent on the real part of $a(t)$. In other words, in Friedmann equation, scale factor is complex. For real observations such as line elements and geodesic equation, the observed effects from the scale factor $a(t)$ is the real part of it instead of the complex value. This simultaneously contains the possibility of complex scale factor, and also connects the real observations based on this formalism.